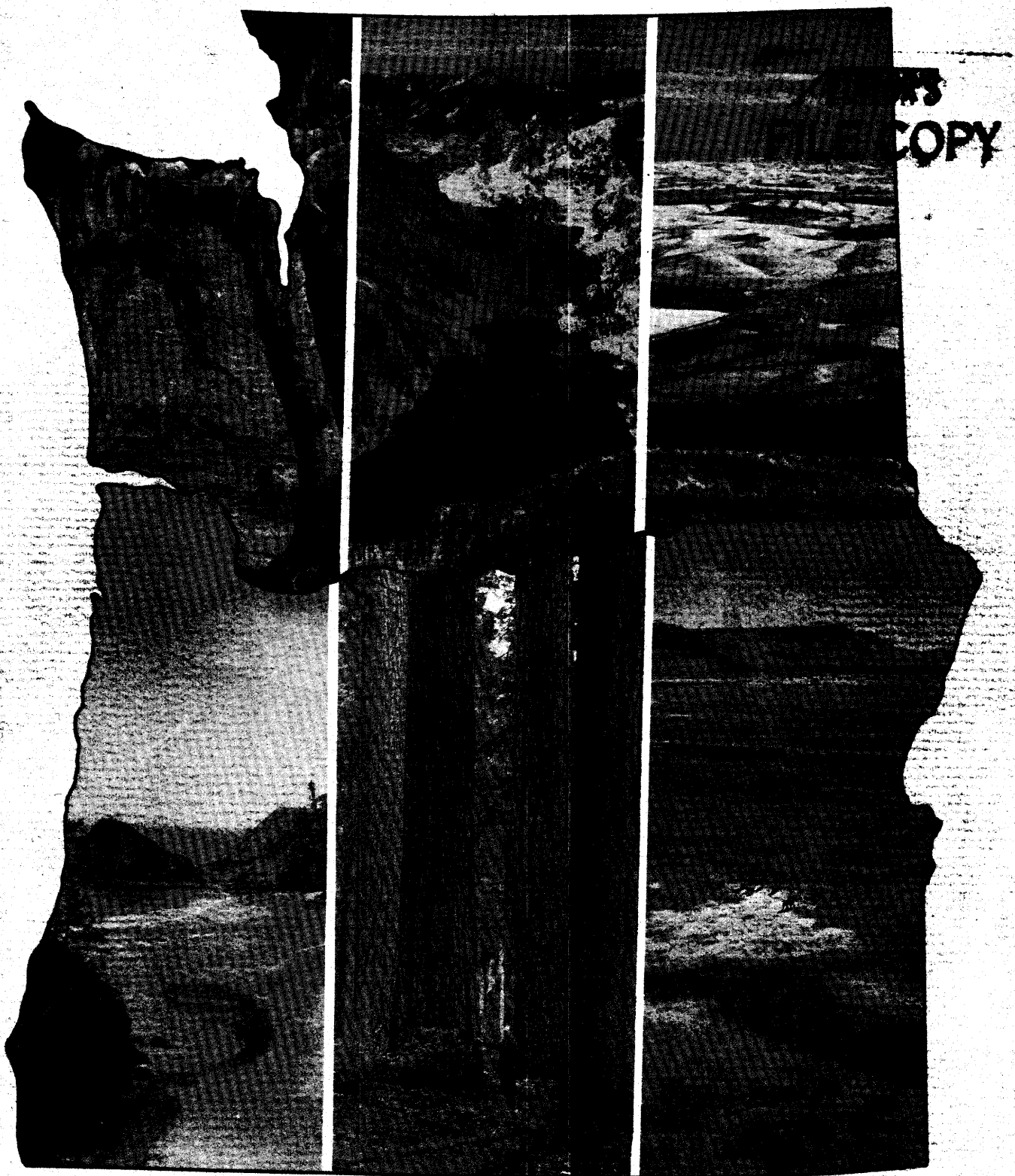
NATURAL VEGETATION OF OREGON AND WASHINGTON



PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
FOREST SERVICE * U.S. DEPARTMENT OF AGRICULTURE
PORTLAND, OREGON

USDA FOREST SERVICE
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1973

PREFACE

In 1969, we prepared a book on the "Vegetation of Oregon and Washington" for participants in the XI International Botanical Congress. Intended as an introduction to the plant communities of the region, it proved popular. Supplies were exhausted within a year.

We elected to completely revise the original book rather than simply reprint it for two reasons. First, the original book was prepared on a tight time schedule, and several expediences of format and content reduced its value as a general guide to the region. Second, a great deal of new information on the vegetation of the region has appeared during the last 4 years, and we have added substantially to our own personal knowledge and accumulated a much larger photo file. Work supported by the Coniferous Forest Biome, US/IBP, and the Pacific Northwest Federal Research Natural Area Committee has been a major help in filling gaps and providing new insights.

We have tried to correct most of the deficiencies in format and content of the original work. Several indices have now been included. Omissions of references to some of the better known plant communities, such as the "Olympic rain forests," have been corrected. Both the new and old soil classification systems have been incorporated in the text.

We have, in fact, produced a new volume which is based on the old one but is not simply a revision; we have given it a new title and series designation rather than labeling it a revised edition of the earlier work.

Preparation of this book has involved contributions from many individuals which we gratefully acknowledge. Many of the deficiencies in the original work were indicated by Jack Major (University of California at Davis) whose review was a major guide in revision. R. Daubenmire (Washington State University), R. Fonda (Western Washington State College), D. Thornburgh (Humboldt State College), W. Moir, D. R. M. Scott (University of Washington), and D. Zobel (Oregon State University) also made numerous valuable comments and criticisms. Portions of the revised manuscript were reviewed by G. Douglas (University of Alberta), R. Emmingham (Oregon State University), R. Fonda, J. Henderson (Utah State University), A. R. Kruckeberg (University of Washington), G. Simonson (Oregon State University), and R. Waring (Oregon State University). R. Carkin (Pacific Northwest Forest and Range Experiment Station) and G. M. Hawk (Coniferous Forest Biome, US/IBP) were of major assistance in checking scientific names and preparing tables. Most of the photographic aerial obliques were taken by Wally Guy, photographer for the Station, who also prepared final prints for the majority of photographs. Glenda Faxon of the Station staff typed most of the manuscript and kept track of many other details during its assembly. Finally, G. Hansen's editorial staff in the Experiment Station deserves special credit for their extensive work in producing this book, particularly B. J. Bell, J. C. Etheridge, M. I. Hoyt, and D. E. Thompson.

This report constitutes Contribution No. 69 to the Coniferous Forest Biome, U.S. International Biological Program.

ABSTRACT

Major vegetational units of Oregon and Washington and their environmental relationships are described and illustrated. After an initial consideration of the vegetation components in the two States, major geographic areas and vegetation zones are detailed. Descriptions of each vegetation zone include composition and succession, as well as discussion of variations associated with environmental gradients. Three chapters treat the forested zones found in the two States. Major emphasis is on the distinctive mesic temperate forests found in western Washington and northwestern Oregon. The interior valley forests, shrub lands, and prairies found between the Coast and Cascade Ranges in western Oregon are treated in a single chapter as are subalpine and alpine mosaics of tree-dominated and meadow communities. Unusual habitats, such as areas of recent vulcanism, serpentines, and ocean strand, are individually described. Soils, geology, and climate are considered in broad outline in an early chapter and in greater detail within discussions of individual geographic areas and vegetation zones. Appendices are included for definition of the various soil types, scientific and common plant names, and a subject index. An extensive bibliography is included to direct the reader to other references.

Keywords: Vegetation, Washington, Oregon, plant communities, plant succession, soils, geology.

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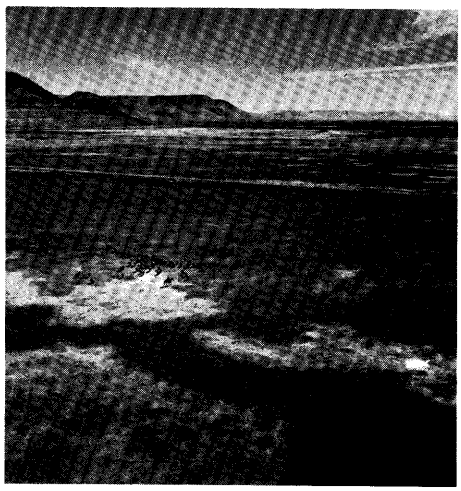

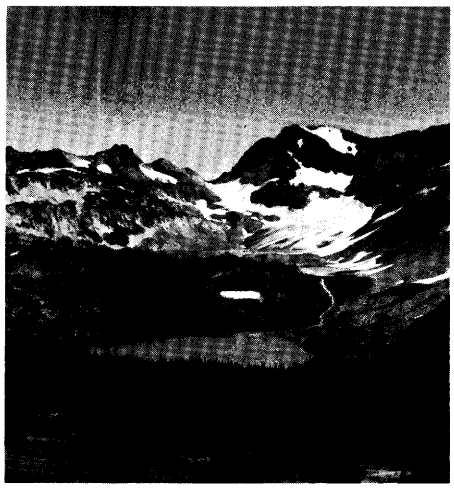

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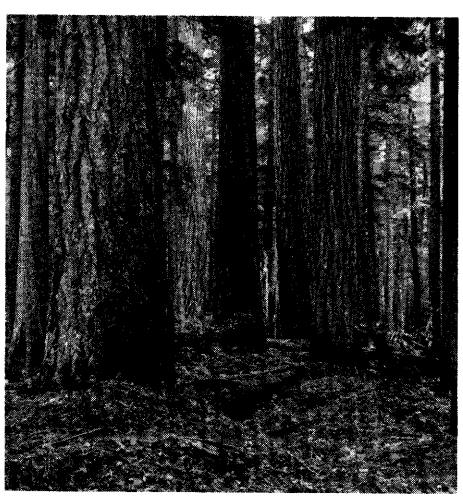


CONTENTS

CHAPTER I. INTRODUCTION

The Pacific Northwest is among the more diverse regions of North America in environment and vegetation. Oregon and Washington, the heart of this region, encompass wet coastal and dry interior mountain ranges, miles of coastline, interior valleys and basins, and high desert plateau (fig. 1). Moisture, temperature, and substrate vary greatly. Natural vegetation types range from dense coastal forests of towering conifers through woodland and savanna to shrub steppe.

The ecology and plant geography of the region have been studied by scientists for over half a century. Major contributors have included W. S. Cooper, R. Daubenmire, H. P. Hansen, L. A. Isaac, V. J. Krajina, D. B. Lawrence, T. T. Munger, M. E. Peck, C. V. Piper, E. H. Reid, and G. B. Rigg. Unfortunately, most of the knowledge which has been gathered is fragmented—dispersed through journals, books, theses, and unpublished files of data.

We present here a generalized account of the major vegetation types within the States of Oregon and Washington, an integration of the scattered information into a regional account. Published articles, theses, and personal data files are the source materials. The unevenness of coverage is unfortunate but unavoidable; some plant formations have been studied in great detail, and other communities or locales have received cursory or no study.

The purpose is threefold: (1) to outline major phytogeographic units and suggest how they fit together and relate to environmental factors; (2) to direct the interested reader to sources of detailed information on the environment and vegetation of the Pacific Northwest, since such information cannot be provided in an account of this size; and (3) to illustrate the major plant communities with photographs.

We hope this outline will enable the scientist or student new to the Pacific Northwest to better understand what he is seeing and how his various observations are related. Perhaps it will also provide some new insights to readers more familiar with the region.

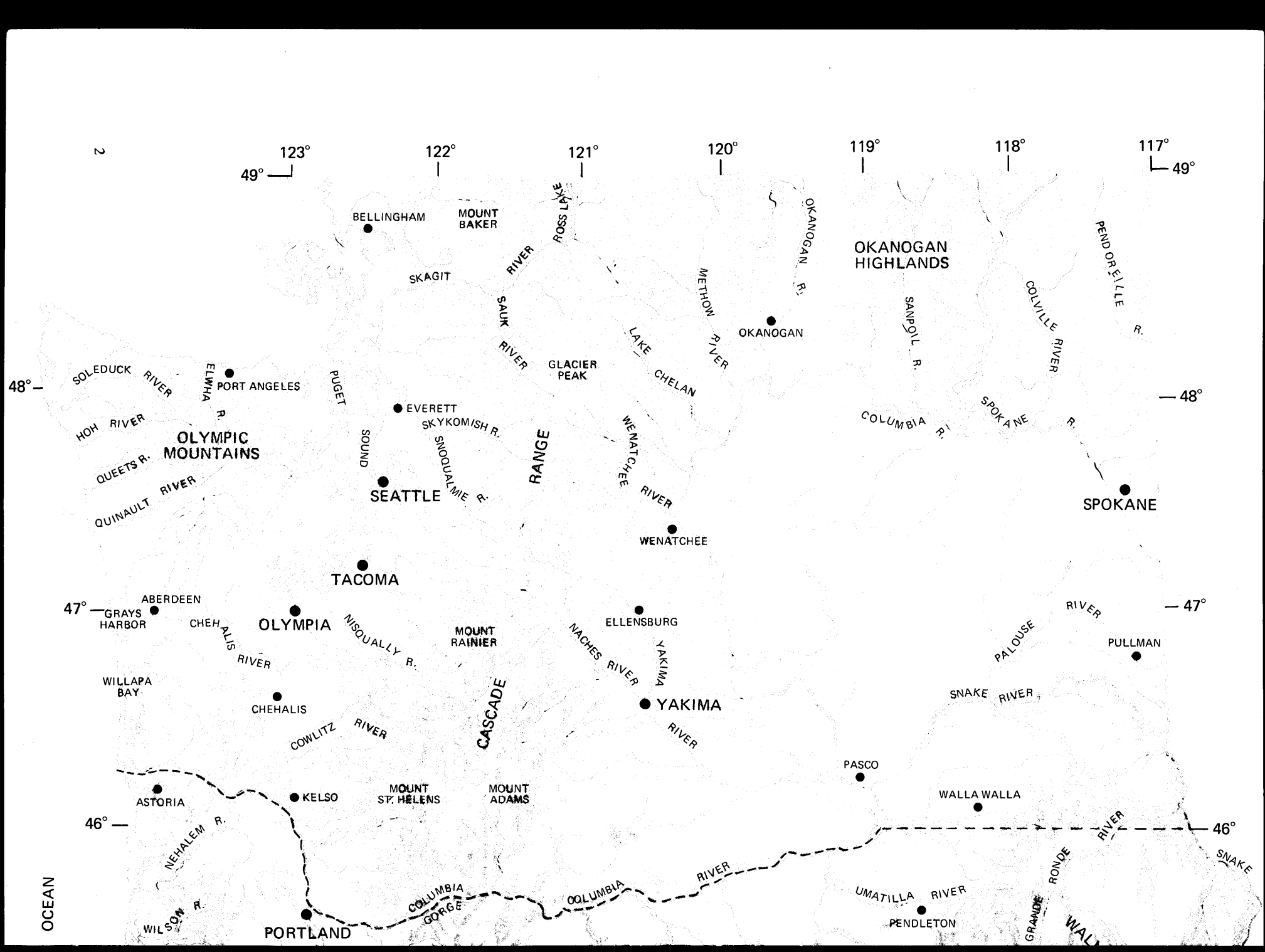
Format, Definitions, and Nomenclature

We have followed the same general format used in our earlier publication (Franklin and Dyrness 1969). The general geologic, edaphic, and climatic features of the region are considered in Chapter II. The broad vegetational patterns and their significance are outlined in Chapter III; readers interested in this subject might also review Daubenmire (1969a). The forest vegetation is considered in Chapters IV, VI, and VII, and the grassland and sagebrush steppe in Chapters VIII and IX. Vegetation found in the valleys of western Oregon is discussed in Chapter V. We conclude with chapters on timberline vegetation (X) and unusual habitats and localities (XI).

Appended to this report are indexes for individual taxa, subjects, and community types which have been recognized and named. We have tried to standardize community names whenever possible using scientific names, slashes (/) between taxa of different life forms or layers and hyphens (-) between taxa of the same life form or layers.

Ecology is fraught with specialized and ambiguous terminology. We have followed Daubenmire's (1968a) definitions in most cases, especially when dealing with synecological terminology, such as climax, association, etc. In some cases, this was not possible due to uncertainty on our part as to the exact meaning of the original authors. The reader unfamiliar with such terms might particularly consider pages 27 to 32, 229 to 237, and 259 to 262 of Daubenmire (1968a) for orientation. The glossaries of Carpenter (1956), Hanson (1962), and Habeck and Hartley (1968) are also helpful.

Plant nomenclature in this paper generally follows these sources: trees, Little (1953); other vascular plants, Hitchcock et al. (1955, 1959, 1961, 1964, 1969) or Peck (1961) for taxa not covered in the former; mosses, Lawton (1965, 1971); and lichens, Howard (1950).


123°
122°
121°
120°
119°
118°
117°
49°
48°
47°
46°
BELLINGHAM
MOUNT BAKER
ROSS LAKE
SKAGIT RIVER
SAUK RIVER
GLACIER PEAK
LAKE CHELAN
METHOW RIVER
OKANOGAN R.
OKANOGAN
OKANOGAN HIGHLANDS
SANPOIL R.
COLVILLE RIVER
PEND OREILLE R.
SOLEDUCK RIVER
ELWHA R.
PORT ANGELES
HOH RIVER
QUEETS R.
QUINAULT RIVER
OLYMPIC MOUNTAINS
PUGET SOUND
EVERETT
SKYKOMISH R.
SNOQUALMIE R.
SEATTLE
CASCADE RANGE
WENATCHEE RIVER
COLUMBIA R.
SPOKANE R.
SPOKANE
WENATCHEE
TACOMA
ABERDEEN
GRAYS HARBOR
OLYMPIA
CHEHALIS RIVER
NISQUALLY R.
MOUNT RAINIER
ELLENSBURG
NACHES RIVER
YAKIMA RIVER
YAKIMA
PALOUSE RIVER
PULLMAN
WILLAPA BAY
CHEHALIS
COWLITZ RIVER
SNAKE RIVER
PASCO
ASTORIA
KELSO
MOUNT ST. HELENS
MOUNT ADAMS
WALLA WALLA
NEHALEM R.
COLUMBIA GORGE
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SNAKE RIVER
UMATILLA RIVER
PENDLETON
GRANDE RONDE
WILSON R.
PORTLAND
OCEAN

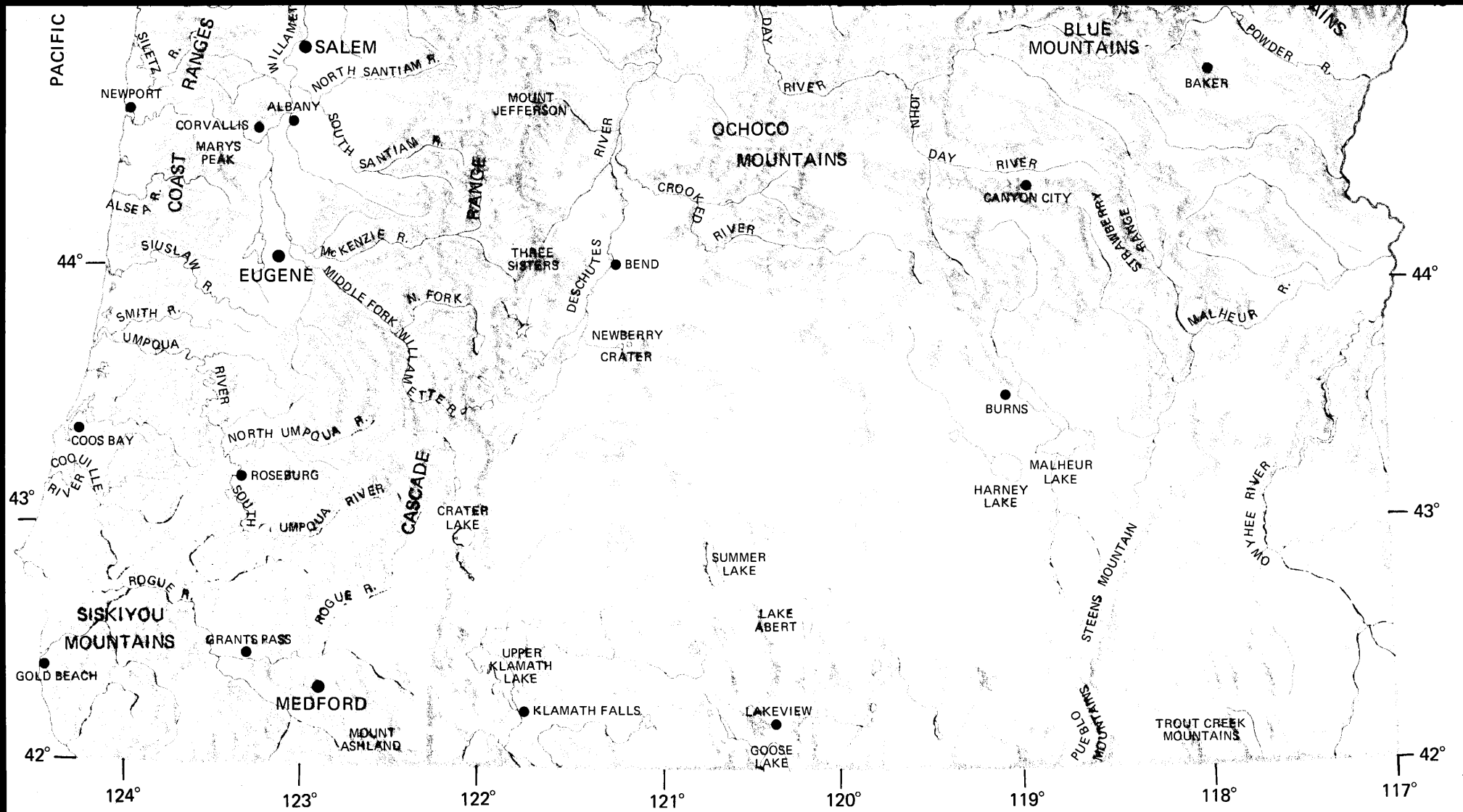

Figure 1. — Major topographic features and some cities and towns in Oregon and Washington.

Whenever possible, nomenclature from older ecological studies cited has been updated. In an appendix are listed the complete scientific names for taxa mentioned along with common names locally applied to many of the plants.

Paleobotany, Paleoecology, and Floristic Evolution

The evolution of the flora and plant formations of Oregon and Washington is a fascinating subject and contributes significantly to understanding the present vegetational mosaic. Unfortunately, it is not within the scope of this paper. We recommend readers interested in these subjects consult the following: Wolfe (1969), Chaney (1938, 1948) and Axelrod (1958) on paleobotany, Hansen (1947) and Heusser (1960) on postglacial vegetation changes and development, and Daubenmire (1947), Mason (1947), and Detling (1968) on evolution of plant formations and floras. Some interesting floristic comparisons of this region with other parts of the world are found in Schofield (1969) and Graham (1972).

CHAPTER II. ENVIRONMENTAL SETTING

Physiography, Geology, and Soils

Since geology, physiography, and at least some aspects of soils are interrelated, we will consider these three environmental features together. In Oregon and Washington, all three present highly varied and complex patterns. Landforms vary from level river valleys and lava plains to precipitous mountain slopes. Elevations range from sea level to over 4,450 meters. The geologic complexity is bewildering in many areas, with formations dating from the Paleozoic era (over 400 million years old) to Recent. Vulcanism has dominated the shaping of much of the landscape, but sedimentary and metamorphic rocks also abound.

Since climate and vegetation are added to landform and geology as factors in soil formation, the tremendous variety of soils is not surprising. For example, zonal great soil groups range from Camborthids (Desert soils) in arid southeastern Oregon to Cryorthods (Podzol soils) in the cool, humid climate of the northern Cascade Range. The most striking soil changes within short distances are found on eastern slopes of the Cascade Range. Here Haplorthods and Haploxerolls (Podzol and Chestnut soils) are separated by only a few kilometers because of abrupt changes in precipitation and concomitant changes from forest to grass-shrub vegetation.

The great relief in extensive mountainous areas within Oregon and Washington perpetuates many soils in a state of profile immaturity. Soils on steep slopes are constantly influenced by gravitational instability expressed as soil creep or landslides, often severely limiting profile development. Consequently, many mountain soils are regosolic or lithosolic, lacking genetic horizons except for a thin A. In these areas, effects of the parent rock on soil properties are major and those of climate and vegetation are minimal. Areas of these immature soils are typically characterized by extensive rock outcroppings.

Volcanic activity along the crest of the Cascade Range during Pleistocene and Recent times has extensively influenced regional soils. Large tracts at higher elevations in the Cascades are mantled with deposits of pumice and volcanic ash which, because of their youth, generally exhibit little genetic development. In many areas, such as the southern Cascade Range of Washington, there have been several depositions of volcanic ejecta; soil profiles often have three or four buried horizon sequences.

Pumice and volcanic ash soils also occur well beyond the Cascade Range. Distance from their source and orientation of these deposits are largely functions of wind direction and velocity during eruptions. Recently, it has become apparent that many, if not most, of the soils of the Pacific Northwest have had some influence from aerially deposited volcanic ejecta. Amounts of incorporated ash and pumice are often small, however, and detectable only through detailed soil mineralogic or micromorphological investigations.

For descriptive purposes, the two-State area has been separated into 15 physiographic provinces (fig. 2). The divisions used are largely those outlined by Baldwin (1964), Fenneman (1931), and Easterbrook and Rahm (1970). Naturally, in many instances, boundaries separating provinces are arbitrary and gradual transitions exist. However, the provinces are broad stratifications of relatively homogeneous areas and reduce complexity to more manageable proportions.

Geologic information for this section is from several primary sources: for Oregon, Baldwin (1964) and "Geologic Map of Western Oregon West of the 121st Meridian" (Wells